

# Trade and Environmental Assessment Model (TEAM)

Developed by Abt Associates Inc. Under Contract from the National Center for  
Environmental Economics / Climate Economics Branch U.S Environmental Protection  
Agency

# TEAM

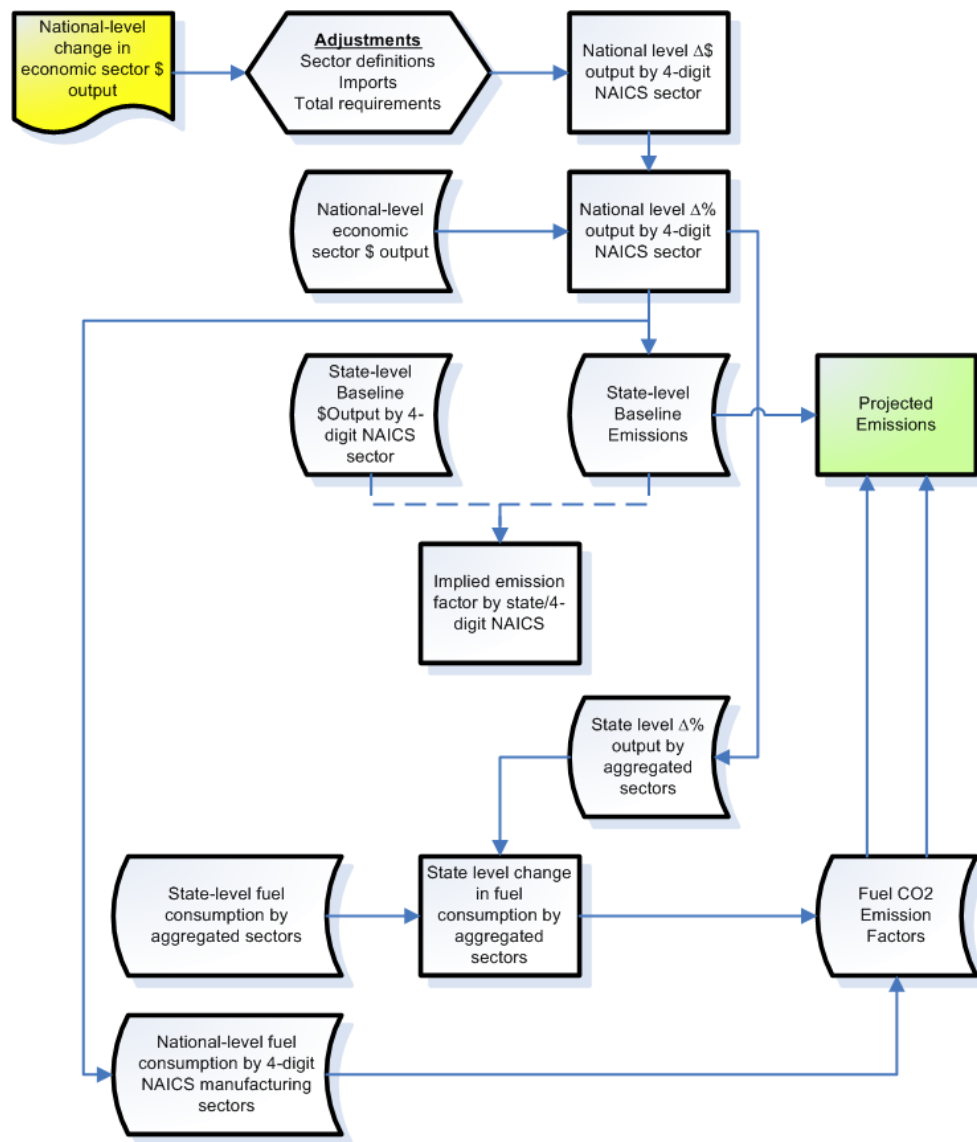
- Designed to estimate environmental impacts resulting from national economic (industry) changes
  - Measures direct and indirect industry impacts AND the associated environmental impacts.
    - Primary or Total Impact
  - Primary use, a screening tool to support the environmental review process.
  - Robust Input- Output Leontief Inverse Matrix Framework

# Environmental Assessments

- Geography
  - National, NERC and State Geography
- 293 4-Digit NAICS Sectors (Except Energy and Carbon)
- 1100 Specific Chemicals / Chemical Groups
  - Hazardous Air Pollutants
  - Water pollutant discharges
  - Carbon Dioxide
  - Energy Consumption by Fuel

# Analytical Framework

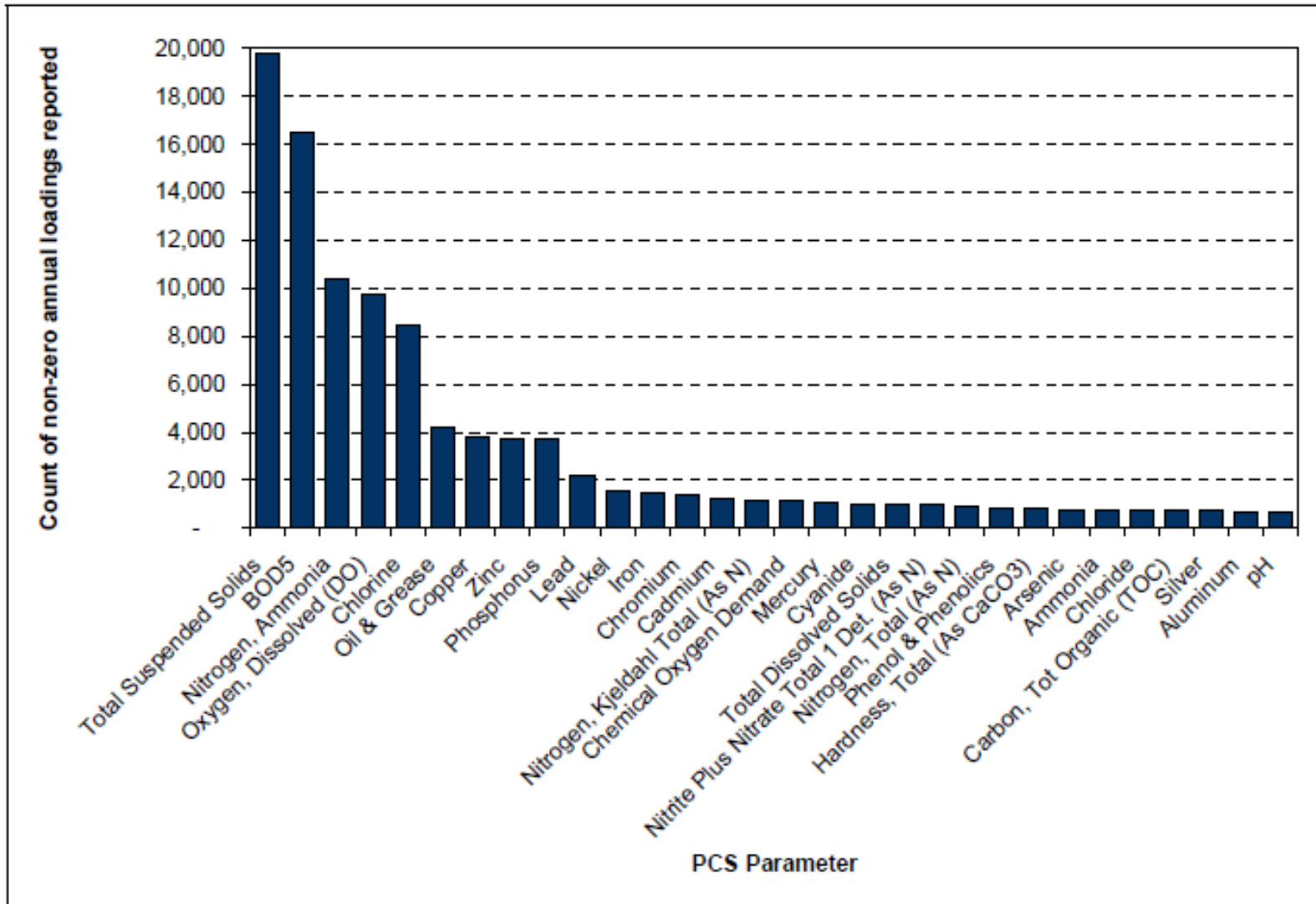
1. Change in National Economic Sector
2. Percent Change in National Sector Output/Emissions (Coefficients)
  1. 4-Digit NAICS Sector
3. State Level Out-put/Emissions **Baseline**
  1. 4-digit NAICS Sector
4. State Level Percent Change Based on National Coefficients



# Key Framework Elements

- Input-Output Analysis
  - Assumption emissions are a fundamental part of production.
- Fixed Coefficients
  - Total Requirements Matrix
  - Direct Requirements Coefficients
- NAICS
  - Production Process Categorization
- State Level Geography
  - Aggregation Consistent with Political Boundaries
- Individual Categories of Pollutants
  - Detail Appropriate for Environmental Analysis

# Permit Compliance System (PCS)



- Most Common Reported PCS Parameters

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Statistical and Economic Analysis for Industry, Labor, and Transportation

# Calculation

- National Level Change in 2002 Dollars
- Calculated Change in Emission/Resource Use
  - Pollutant/Resource Media
  - Economic Sector
  - Location (State)
- Definition of Emission Factor = *Value of Baseline Emissions/Resources Use for a Given Pollutant/Resource, State and Economic Sector - Divided by the Value of Baseline Economic Activity...*

$$Impact\_NAICS_{i,j} = \frac{Rev_{i,j} \times Impact\_NAICS_i}{\sum_{j=1}^N Rev_{i,j}} \quad \dots\text{etc.}$$

# Compiling Reporting Results

<b>Pollutant/Resource Category</b>	<b>Reporting Elements</b>	<b>Reporting Elements (Chemicals) with Toxic Weighting Factors</b>
Point Source Air Emissions	396	270
Area Source Air Emissions	149	127
Mobile Source Air Emissions	31	21
Indirect Water Discharges	244	206
Direct Water Discharges	233	157
CO <sub>2</sub> Emissions (SEDS-derived)	2	N/A
Energy Use (SEDS-derived)	7	N/A
CO <sub>2</sub> Emissions (MECS/Census-derived)	7	N/A
Energy Use (MECS/Census-derived)	9	N/A

# Utility Example (NAICS 2211)

- Economic Census Suppresses State Level Utility Sector Data
- Reported at National Level
  - Apportioned Emission/Discharges using Retail Value of Electricity Generated versus Consumption
- Example
  - NAICS4
  - 2007 (Impact Year)
  - 1000000
  - Total (Total Impacts- Not Just Sector 2211)
  - 2211 (4-Digit NAICS Sector)
  - Value of impact 3500.00 (3.5 billion)

# Run Statistics

- Model Run Time : 04-29-10 09:20:59 to 04-29-10 09:21:39
- Result memory used: 49329 kb
- Number of Emissions Analyzed: 1095906
- Number of Chem Mismatches: 51140
- Chemicals not found
  - CIH
  - N\_as\_N
  - NOX
  - TOTAL-PEST
  - TOTAL-PHTH

# Sample Output: Direct Water Discharges, VA

Select Impact Type to view

Drag a column header here to group by that column

Sector ID	Sector	Region	Chemical	Baseline Value	Scenario Value	Change
2211	Electric Power Generation, Transmission and Distr	Virginia	Total Chemicals	96,811,630	97,664,068.374	852,438.374
2211	Electric Power Generation, Transmission and Distr	Virginia	Ammonia	808	815.115	7.115
2211	Electric Power Generation, Transmission and Distr	Virginia	Arsenic	1,742	1,757.339	15.339
2211	Electric Power Generation, Transmission and Distr	Virginia	Arsenic compounds	1,602	1,616.106	14.106
2211	Electric Power Generation, Transmission and Distr	Virginia	Barium compounds	52,730	53,194.294	464.294
2211	Electric Power Generation, Transmission and Distr	Virginia	Chlorine	266	268.342	2.342
2211	Electric Power Generation, Transmission and Distr	Virginia	Chromium	994	1,002.752	8.752
2211	Electric Power Generation, Transmission and Distr	Virginia	Chromium compounds	1,326	1,337.676	11.676
2211	Electric Power Generation, Transmission and Distr	Virginia	Cobalt compounds	226	227.99	1.99
2211	Electric Power Generation, Transmission and Distr	Virginia	Copper	3,834	3,867.759	33.759
2211	Electric Power Generation, Transmission and Distr	Virginia	Copper compounds	28,826	29,079.816	253.816
2211	Electric Power Generation, Transmission and Distr	Virginia	Lead compounds	202	203.779	1.779
2211	Electric Power Generation, Transmission and Distr	Virginia	Manganese compounds	112,192	113,179.864	987.864
2211	Electric Power Generation, Transmission and Distr	Virginia	Mercury compounds	34	34.299	.299
2211	Electric Power Generation, Transmission and Distr	Virginia	Nickel	13,950	14,072.831	122.831
2211	Electric Power Generation, Transmission and Distr	Virginia	Nickel compounds	3,748	3,781.002	33.002
2211	Electric Power Generation, Transmission and Distr	Virginia	Selenium compounds	866	873.625	7.625
2211	Electric Power Generation, Transmission and Distr	Virginia	Xylene (mixed isomers)	11,808	11,911.971	103.971
2211	Electric Power Generation, Transmission and Distr	Virginia	Zinc (fume or dust)	10,594	10,687.281	93.281
2211	Electric Power Generation, Transmission and Distr	Virginia	Zinc compounds	73,068	73,711.373	643.373
2211	Electric Power Generation, Transmission and Distr	Virginia	Vanadium compounds	792	798.974	6.974
2211	Electric Power Generation, Transmission and Distr	Virginia	NITROGEN	16,410,580	16,555,077.186	144,497.186
2211	Electric Power Generation, Transmission and Distr	Virginia	Iron	212	213.867	1.867
2211	Electric Power Generation, Transmission and Distr	Virginia	Total Organic Carbon (TOC)	332,676	335,605.253	2,929.253
2211	Electric Power Generation, Transmission and Distr	Virginia	PHOSPHORUS	1,803,058	1,818,934.149	15,876.149
2211	Electric Power Generation, Transmission and Distr	Virginia	HYDROCARBONS, PETROLEUM	376	379.311	3.311
2211	Electric Power Generation, Transmission and Distr	Virginia	PSC-PRAM TDA3B	73,743,258	74,392,576.506	649,318.506
2211	Electric Power Generation, Transmission and Distr	Virginia	PSC-PRAM TDA6C	727,096	733,498.17	6,402.17
2211	Electric Power Generation, Transmission and Distr	Virginia	TOTAL SUSPENDED SOLIDS	1,873,710	1,890,208.248	16,498.248
2211	Electric Power Generation, Transmission and Distr	Virginia	PSC-PRAM TTP6C	1,601,056	1,615,153.496	14,097.496

Water Discharges: Pounds

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# Sample Output: Chemical by Region

Show me the    by

using  abs()  for impact

Restrict output to th

Only select non-zero values

Chemical	PctChange	BaselineValue	ScenarioValue	Change
[-] Chemical : Boron				
[-] Region : Illinois				
Boron	8.805E-01	924,682	932,823.939	8,141.939
[-] Region : Louisiana				
Boron	8.805E-01	132,766	133,935.021	1,169.021
+ Region : Michigan				
+ Region : Minnesota				
+ Region : New York				
+ Region : North Dakota				
+ Region : Ohio				
+ Region : Oregon				
+ Region : Pennsylvania				
+ Chemical : CHLORINE PRODUCED OXIDANTS				
+ Chemical : Ethylbenzene				
+ Chemical : Hydrazine				

## Sample Output:

Impact- Direct Water Discharges

Sector- 2211

Chemical- Boron



# Application Versatility

- Track Specific Emissions Impacts by Proposed Industry Projects
- Transportation Impacts
- Electricity Use by NERC Region
- Compare Industry Alternatives
- Connect New Technologies to Reduced Industry Emissions
- Create Complete Impacts of Economic Shocks Not Limited to Jobs, Infrastructure, Tax, Etc.

# Summary

- First Applied Environmental Economic Impact Model
- Framework Based on Input-Output Matrix
- Intuitive, Predictable, and Measureable (no black box)
- Connects Economic Events with Associated Environmental Impacts